

## RESPIRATORY MASK WITH AN AIR-IMPERMEABLE SHIELD

## BACKGROUND OF THE INVENTION

## 1. Field of the invention

This invention relates to a respiratory mask  
5 with a filter sheet and an air-impermeable shield  
disposed frontwardly and connected to the filter  
sheet.

## 2. Description of the related art

Conventional respiratory masks normally  
10 include a filter sheet that is permeable to air and  
that is exposed to the atmosphere so as to permit air  
flow therethrough upon breathing. However, the  
conventional respiratory masks are disadvantageous  
in that they cannot provide effective protection for  
15 the wearer from transmission of virus carried by  
infectious droplets that attach thereto. When the  
respiratory mask worn on a wearer is accidentally  
contaminated with virus-containing droplets, the  
droplets will gradually evaporate and there is a  
20 tendency for the virus carried by the droplets to be  
sucked by the wearer through the mask during  
breathing.

## SUMMARY OF THE INVENTION

Therefore, the object of the present invention  
25 is to provide a respiratory mask with an air-  
impermeable shield that is capable of overcoming the  
aforesaid drawback of the prior art.

According to one aspect of the present invention, there is provided a respiratory mask that comprises: a shield including a bent sheet that is made from a material impermeable to air, that defines a rim-receiving recess at a concave side of the bent sheet, and that has a central portion which is adapted to confront the nose and the mouth of a wearer; and a mask body detachably connected to the shield and including a rim that is received in the rim-receiving recess, that defines a chamber therein for receiving the nose and the mouth of the wearer, and that has an outer end in contact with the central portion of the bent sheet, and an inner end opposite to the outer end and adapted to contact the face of the wearer. The rim is formed with at least an aperture that is disposed between the inner and outer ends and that is in spatial communication with the chamber. The mask body further includes a filter sheet that is permeable to air and that is attached to the rim to cover the aperture. The filter sheet cooperates with the bent sheet to define a gap therebetween. The gap is in fluid communication with the chamber through the filter sheet and the aperture.

According to another aspect of this invention, there is provided a respiratory mask that comprises: a shield including a bent sheet that is made from a material impermeable to air, and that defines a

receiving recess at a concave side of the bent sheet,  
the receiving recess having a size that is sufficient  
to cover the nose and the mouth of a wearer, the bent  
sheet having two opposite sides, each of which is  
5 formed with a pair of upper and lower strap holes;  
and a mask body detachably connected to the shield,  
received in the receiving recess, and including a  
filter sheet that is permeable to air, and a pair of  
opposite straps that are respectively secured to two  
10 opposite sides of the filter sheet. Each of the straps  
has two opposite ends that respectively extend  
through the upper and lower strap holes. The upper  
and lower strap holes are spaced apart from each other  
by a distance that is greater than the length of the  
15 respective one of the opposite sides of the filter  
sheet.

#### BRIEF DESCRIPTION OF THE DRAWINGS

In drawings which illustrate embodiments of the  
invention,

20 Fig. 1 is an exploded rear perspective view of  
the first preferred embodiment of a respiratory mask  
according to the present invention;

Fig. 2 is a sectional view of a shield of the  
respiratory mask of Fig. 1;

25 Fig. 3 is a front perspective view to illustrate  
the respiratory mask of Fig. 1 in a state of use;

Fig. 4 is a rear view of the respiratory mask

of Fig. 1;

Fig. 5 is a perspective view of the second preferred embodiment of the respiratory mask according to the present invention;

5 Fig. 6 is an exploded rear perspective view of the third preferred embodiment of the respiratory mask according to the present invention;

Fig. 7 is a rear perspective view of the third preferred embodiment to illustrate how a shield is  
10 connected to a mask body;

Fig. 8 is a front perspective view to illustrate the respiratory mask of Fig. 6 in a state of use;

Fig. 9 is an exploded rear perspective view of the fourth preferred embodiment of the respiratory  
15 mask according to the present invention;

Fig. 10 is a side sectional view of the fourth preferred embodiment; and

Fig. 11 is a top sectional view of the fourth preferred embodiment.

20 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

For the sake of brevity, like elements are denoted by the same reference numerals throughout the disclosure.

Figs. 1 to 4 illustrate the first preferred  
25 embodiment of a respiratory mask according to the present invention. The respiratory mask includes: a shield having a bent sheet 1 (note that the bent sheet

1 is transparent) that is made from a material (such as plastics) impermeable to air, that defines a rim-receiving recess 10 at a concave side of the bent sheet 1, and that has a central portion 12 which is adapted to confront the nose and the mouth of a wearer; and a mask body 2 detachably connected to the shield and including a rim 21 that is received in the rim-receiving recess 10, that defines a chamber 20 therein for receiving the nose and the mouth of the wearer, and that has an outer end 214 in contact with the central portion 12 of the bent sheet 1, and an inner end 213 opposite to the outer end 214 and adapted to contact the face of the wearer. The rim 21 has an outer surface 210 that extends between the inner and outer ends 213, 214, and is formed with a plurality of apertures 212 that are in spatial communication with the chamber 20. The mask body 2 further includes a filter sheet 22 that is permeable to air and that is attached to the rim 21 to cover the apertures 212. The filter sheet 22 cooperates with the bent sheet 1 to define a gap 26 therebetween (see Fig. 3). The gap 26 is in fluid communication with the chamber 20 through the filter sheet 22 and the apertures 212, and has a volume that is small so as to minimize the amount of the exhaled air trapped in the gap 26.

Preferably, the central portion 12 of the bent sheet 1 is formed with an endless groove 13 that

protrudes outwardly of the rim-receiving recess 10 and that receives the outer end 214 of the rim 21 therein so as to permit the bent sheet 1 to be firmly held on the mask body 2.

5           The filter sheet 22 has a rim portion 221 that surrounds and that covers the outer surface 210 of the rim 21, a pair of opposite side portions 222 that extend outwardly from the rim portion 221 for contacting the cheeks of the wearer, and a lower  
10       portion 223 for contacting the chin of the wearer.

          The bent sheet 1 further has a pair of opposite cheek portions 11 that extend transversely and respectively from two opposite sides of the central portion 12 and that respectively confront the side  
15       portions 222 of the filter sheet 2, and a chin portion 15 that extends transversely from a bottom side of the central portion 12, that interconnects the cheek portions 11, and that confronts the lower portion 223 of the filter sheet 22. The cheek and chin portions  
20       11, 15 of the bent sheet 1 cooperate with the side and lower portions 222, 223 of the filter sheet 22 to define the gap 26 thereamong.

          Each of the cheek portions 11 of the bent sheet 1 is formed with at least a pair of strap holes 14.  
25       The respiratory mask further includes two pairs of straps 23 that are respectively secured to the side portions 222 of the filter sheet 22 and that

respectively extend through the strap holes 14 in the cheek portions 11 of the bent sheet 1.

The rim 21 has a top end portion 211 (see Fig. 4) with a shape that conforms to the contour of the bridge and two sides of the nose of the wearer.

Fig. 5 illustrates the second preferred embodiment of the respiratory mask of this invention, which is similar to the previous embodiment, except that the bent sheet 1 is further formed with an eye-protecting portion 111 extending upwardly from a top side of the bent sheet 1 so as to cover the eyes of the wearer when the respiratory mask is in use.

Figs. 6 to 8 illustrate the third preferred embodiment of the respiratory mask of this invention, which differs from the first embodiment in the structure of the shield. The bent sheet 1 of the shield of this embodiment is V-shaped instead of U-shaped. The shield further includes a flexible top rib 34 that is secured to the top side of the bent sheet 1 and that crosses the central and cheek portions 12, 11 of the bent sheet 1, and a flexible lower rib 35 that is secured to the bent sheet 1 below the top rib 34 and that crosses the central and cheek portions 12, 11 of the bent sheet 1. The central portion 12 of the bent sheet 1 is formed with a V-shaped groove 33 that extends from the bottom side to the top side of the bent sheet 1 in a transverse direction relative to

the top and lower ribs 34, 35. The filter sheet 2 further has a central portion 224 that extends inwardly of the rim 21 from the rim portion 221 of the filter sheet 22 and that covers the chamber 210 at the outer end 214 of the rim 21, and a protrusion 2221 that protrudes outwardly from the central portion 224 of the filter sheet 22 into the V-shaped groove 33. The bent sheet 1 is formed of a plurality of non-woven fabric layers 31 (see the cutaway region in Fig. 6) and an air-impermeable plastic layer 32 embedded in the non-woven fabric layers 31. The top and lower ribs 34, 35 permit shaping of the bent sheet 1 to conform to the contour of the face of the wearer.

Figs. 9 to 11 illustrate the fourth preferred embodiment of the respiratory mask of this invention, which is similar to the third embodiment, except that the mask body 2 is a general surgical mask. The bent sheet 1 has two opposite sides, each of which is formed with a pair of upper and lower strap holes 14. The mask body 2 is detachably connected to the bent sheet 1 of the shield, is received in the receiving recess 33, and includes a filter sheet 22 that is permeable to air, and a pair of opposite straps 41 that are respectively secured to two opposite sides 221 of the filter sheet 22. Each strap 41 has two opposite ends that respectively extend through the upper and lower strap holes 14. The upper and lower strap holes 14



are spaced apart from each other by a distance greater than the length of the respective one of the opposite sides 221 of the filter sheet 22 so as to raise the bent sheet 1 and so as to permit the formation of the  
5 gap 26 between the bent sheet 1 and the filter sheet 22.

With the inclusion of the shield in the respiratory mask of this invention, the drawback as encountered in the prior art can be eliminated.

10 With the invention thus explained, it is apparent that various modifications and variations can be made without departing from the spirit of the present invention.